Three New Species of *Euphorbia* (Euphorbiaceae) from South Tropical Africa

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Abstract. Three new species, *Euphorbia namuliensis* Bruyns, *E. marrupana* Bruyns, and *E. stenocaulis* Bruyns (Euphorbiaceae), are described from the botanically poorly known northern parts of Moçambique.

Key words: *Euphorbia*, Euphorbiaceae, Moçambique.

Euphorbia L. is a cosmopolitan genus of ca. 2000 species, of which some 500 are succulent. The succulent species are mainly concentrated in Africa, Arabia, India, and Madagascar, with particularly high diversity in southern Africa and North East Africa. In the past these succulent species have been divided into a bewildering array of subgeneric groupings. Recent molecular research (Steinmann & Porter, 2002; Bruyns et al., 2006) has shown that many, if not most, of these groupings are artificial and not monophyletic. Consequently, it has been proposed that the succulent species be accommodated within four subgenera (Bruyns et al., 2006). Of these, subgenus *Euphorbia* includes (as section *Euphorbia*) all the succulents bearing paired spines on a hardened, horny spine shield surrounding the leaf. Section *Euphorbia* is confined to the Old World, where it is found in Africa and Arabia as well as on and around the Indian subcontinent. It is particularly diverse in tropical Africa.

The new species of *Euphorbia* described here all come from the northern parts of Moçambique. Moçambique is mostly a moist country during the summer months, with average annual rainfall varying between 600 and 2000 mm. Despite this generally high rainfall, the succulent, spiny, spine shield–bearing species making up *Euphorbia* sect. *Euphorbia* are fairly well represented in the country, and they are found in two main habitats. One is the relatively dry "forest" of the coastal plain. These forests have been much destroyed, but remnants are found from the south around Maputo at least as far north as Beira. The other habitat where they are frequently encountered is in shallow pockets of soil on granite domes. Granite domes are mainly found in the north of the country, especially north of the Zambezi River, and are often located in areas receiving an annual rainfall of well over 1000 mm. These domes vary from small hillocks projecting 20–200 m or more from the surrounding bush to the vast series of granite peaks known as Mount Namuli, which rise to over 2400 m and are the highest mountains in the country.

Among the species of *Euphorbia* sect. *Euphorbia* in south tropical Africa, there are two main growth forms: large shrubs to trees with thick stems and usually with a trunk-like central stem with a different shape to the side branches, and smaller shrubs with slender stems and without a differently shaped central stem. The following three new species belong to section *Euphorbia*, and all have the latter growth form.

Euphorbia namuliensis Bruyns, sp. nov. TYPE: Moçambique. Zambézia: Namuli, 800–1500 m, 4 Jan. 2004, *P. V. Bruyns 9723* (holotype, BOL; isotypes, K, MO). Figure 1A–E.

Ab omnibus aliis speciebus *Euphorbiae* in regione caulibus hexagonis rhizomatosis atrovirentibus et spinis stipulaceis spinas binatas longiores fere aequantibus differt.

Erect, shortly rhizomatous succulent to 40 cm tall with few unbranched stems; *stems* 6-angled, 12–20 mm thick, dark green; angles without teeth, spine groups 0.5–1 cm apart; spines below leaves gray to brown, paired, 5–8 mm, spreading; stipular spines 4–6 mm, ascending; spine shields often rudimentary, 1–4 × 1–2 mm, ± elliptical. *Leaf-rudiments* subulate, 2–3 × 2 mm. *Inflorescences* of solitary cymes, each with 3 cyathia (central male, 2 laterals developing later and female), on peduncle 1–2 mm, arranged in vertical series and maturing nearly simultaneously. *Cyathia* 3 mm, 3–4 mm diam., with reddish adpressed bracts ca. 1 mm, red, broadly funnel-shaped, smooth and glabrous; glands rectangular-elliptical, purplish green with black margins, 1 × 2 mm, contiguous; lobes ± semicircular, ca. 1 mm × ca. 1 mm, maroon, with deeply dentate margins; male flowers with spathulate deeply dentate bracteoles, ca. 2 mm, red, with pedicel 1.5–2 mm; female flowers with red ascending styles, 1 mm, joined at base and with very much thickened apices. *Capsules* glabrous,

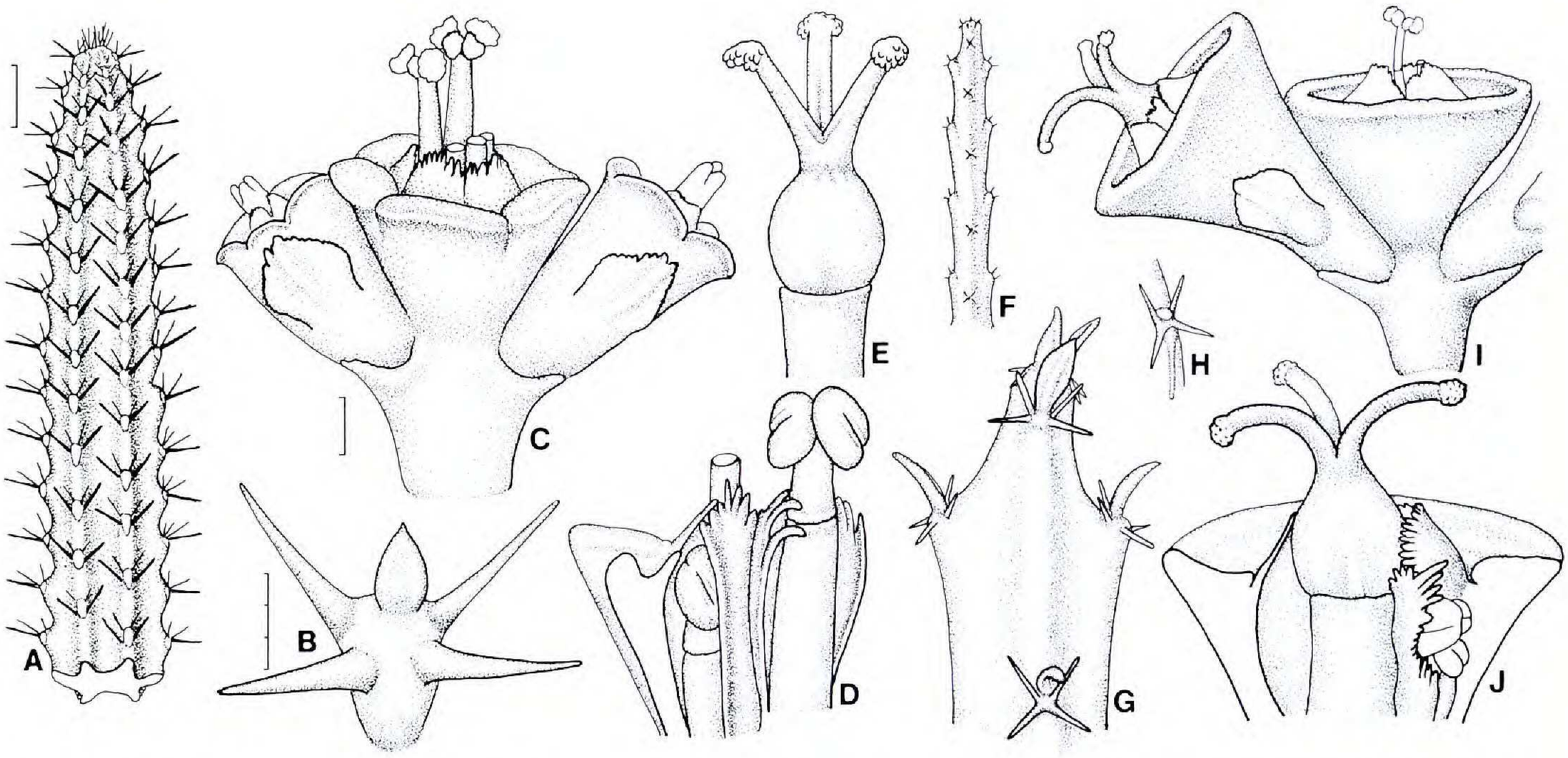

Figure 1. *Euphorbia namuliensis* (A–E, *Bruyns 9723*) and *Euphorbia stenocaulis* (F–J, *Bruyns 8534*). —A, F, G. Upper part of stem. —B, H. Spine complex, in B showing only spines, leaf-rudiment, and spine shield, in H showing spines and narrow spine shield descending below spines. —C, I. Cyme of three cyathia. —D, J. Dissected cyathium (male only in D, bisexual in J). —E. Female floret. Scale bars: A, F = 10 mm (at A); B, G, H = 3 mm (at B); C, I = 1 mm (at C); D, E, J = 1 mm (at B).

not exserted, 5 mm diam., red-green; seeds gray, covered with low rounded tubercles, nearly spherical, 2 mm.

This new species is common on the northern slopes of the Mount Namuli complex in Zambézia Province, Moçambique. *Euphorbia namuliensis* was found to have a wide altitudinal range, and plants were seen from the hotter outcrops near the base at about 800 m to some of the cooler, higher slopes. It grows among dense clumps of *Coleochloa* Gilly and various species of *Xerophyta* Jussieu on exposed, granite domes. Other succulents sharing the habitat were *Aloe chabaudii* Schönland, *A. mawii* Christian, *Kalanchoe elizae* A. Berger, *K. humilis* Britten, and *Sarcostemma viminale* (L.) R. Brown. Although very small forms of *E. mlanjeana* L. C. Leach were observed much higher up and farther southeast in the Namuli complex, no other species of *Euphorbia* was noted in the immediate vicinity. The rainfall in this area probably exceeds 1000 mm per annum, and deeper soils on the mountain support an open forest of *Brachystegia* Bentham, while orchids and other mesophytic monocots were quite common in less exposed spots.

With their rhizomatous habit, plants of *Euphorbia namuliensis* form very diffuse clumps. Within a clump, the stems are connected underground by horizontal runners up to 20 cm long or more, which are able to burrow through the extremely compacted, tough and dense, fibrous masses of the roots of *Coloechloa* and *Xerophyta*. The above-ground portions of the 6-angled stems are erect and unbranched and are dark green, with a gray spinescence. Their almost cylindrical shape is remarkably cactoid. They are covered with a very even spinescence, where the two stipular spines flanking the leaf-rudiment are only slightly shorter than the two spines below the leaf-rudiment. The spine shield on which all of them arise is inconspicuous and does not extend significantly downward to the next leaf-rudiment. The two stipular spines are mostly oriented upward against the stem, while the other two spines spread horizontally. The distinctively subulate and fleshy, upwardly curved leaf-rudiments are found on young growth in the upper 2–3 cm of the stems.

The stems of this new species are reminiscent of *Euphorbia baioensis* S. Carter from northern Kenya and *E. whellanii* L. C. Leach from northern Zambia. Of these two, the most similar in appearance is *E. whellanii*, which differs by the much thinner stems (to 8 mm diam.), very much smaller leaf-rudiments (to 0.5 mm long), shorter spines (to 3.5 mm long) that are also much less robust than those of *E. namuliensis*, and by the yellow cyathial glands (Leach, 1967). The relationships of *E. namuliensis* are more likely to lie among the various shrubby species found elsewhere in Moçambique. Within 100 km of where it occurs, *E. contorta* L. C. Leach, *E. decliviticola* L. C. Leach, and *E. mlanjeana* are found. The last two are much larger species with considerably thicker stems and a very much thicker, trunk-like central stem, and it is thus particularly to *E. contorta* that the new species must be compared. *Euphorbia contorta* is also a few-stemmed shrub without a morphologically distinct central trunk, and it occurs in a restricted area

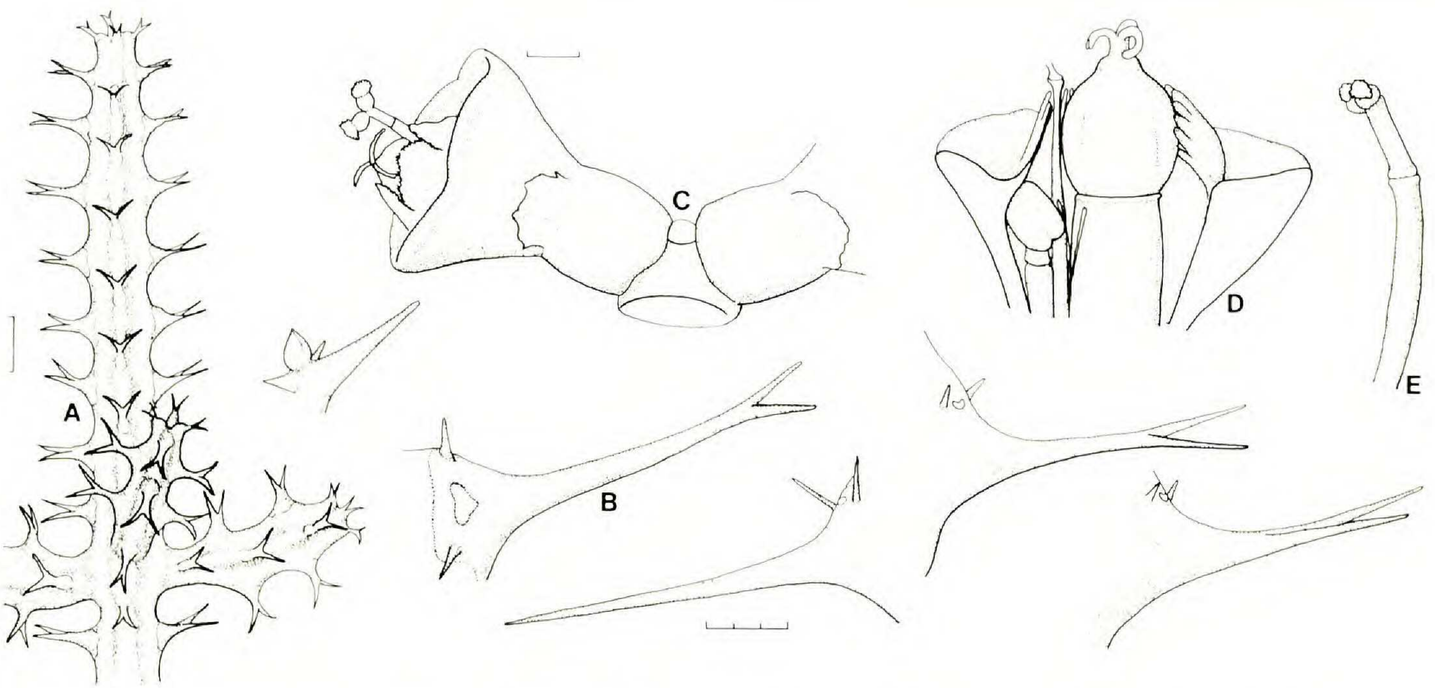

Figure 2. *Euphorbia marrupana* (*Bruyns 9707*). —A. Upper part of stem. —B. Spine complexes (young complex with leaf-rudiment shown in small sketch to right of A). —C. Cyme of three cyathia. —D. Dissected bisexual cyathium. —E. Male floret. Scale bars: A = 10 mm; B = 3 mm; C = 1 mm; D, E = 1 mm (at B).

between the towns of Lioma, Cuamba, and Malema, northwest of Mount Namuli in Zambézia and Nampula Provinces. In *E. contorta* the 4- to 7-angled stems are not at all rhizomatous. They are erect with horizontal branches, and the main stem spreads horizontally once it is sufficiently long (usually at about 0.3 m). In this way individual plants form diffuse shrubs. The stems are always distinctly grayish green and are armed with paired spines below the leaves, which are much larger than the two stipular prickles. The leaf-rudiments, usually at least 8 mm long, are comparatively large and broadly ovate in *E. contorta*. Here the cyathia (usually 5–6 mm diam.) are much broader than those of *E. namuliensis*, and they are held closer to the stems on very short peduncles.

Euphorbia marrupana Bruyns, sp. nov. TYPE: Moçambique. Niassa: E of Marrupa, 600 m, 2 Jan. 2004, *P. V. Bruyns 9708* (holotype, BOL). Figure 2.

Ab *Euphorbia unicorni* R. A. Dyer scutellis spiniferis brevioribus quam internodiis, aculeis stipularis juxta folios et glandibus cyathii divisis discedit.

Erect succulent to 1 m tall with many spreading stems, branching only above base, branches usually arising in groups along stems; *stems* 4- to 7-angled, 10–20 mm thick, dark gray-green often mottled with cream on young growth; angles toothed, spine groups 10–15 mm apart, spines below leaves black, solitary but often forked above base, 6–12 mm, spreading; stipular prickles up to 2 mm, ascending but inconspicuous; spine shields small, spreading downward to less than half distance to next leaf, 5–8 × 2–3 mm, linear-elliptic. *Leaf-rudiments* ovate, 1–2 × 1–2 mm. *Inflorescences* of solitary cymes, each with 3 cyathia (central male, 2 laterals bisexual, but on some plants male only) on peduncle up to 1 mm. *Cyathia* 2.5 mm, 3–4 mm diam., with pink bracts 1 mm, red to yellow, broadly funnel-shaped, smooth and glabrous; glands distinctly separate, yellow sometimes with red margins; lobes ± semicircular, 1.5 mm, red, with deeply dentate margins; male flowers with spathulate and deeply dentate bracteoles, 1–1.5 mm, red, with red pedicel to 3 mm; female flowers green, with spreading red styles up to 1 mm, on thick pedicel 1.5 mm. *Capsules* glabrous, remaining embedded within cyathial lobes, 4 mm diam., dark maroon along edges, rest cream; seeds gray with darker streaks, covered with rounded tubercles, very slightly longer than broad (ellipsoidal), ca. 1.8 mm.

The only species of *Euphorbia* found on the granite mountains where it occurs, this new species is fairly plentiful, but plants are usually quite scattered. As with all the "dome-dwellers," it grows in shallow soils in dense mats of *Coleochloa*. Plants are much damaged by the frequent fires that are lit on these mountains during the dry season, and this is probably the reason for their very scattered occurrence. Other succulents occurring with it are *Aloe mawii*, *Kalanchoe elizae*, and another species of *Kalanchoe* Adanson as well as *Sarcostemma viminale*. The rainfall in this area is high, probably exceeding 1500 mm per year.

Plants are usually extremely densely and irregularly branched, forming a fairly impenetrable shrub. The stems are peculiar for the variability from square, 4-angled stems to cylindrical stems with 6 or 7 angles and for the unusual variability in the spines. These are always single but are simple to deeply forked (Fig. 2B). In seedlings, the first spines that appear do so as four nearly equal spines around 1 mm long surrounding each leaf-rudiment. The stipular spines remain small, while the others are greatly modified later.

This species resembles *Euphorbia unicornis* in the often cylindrical stems with single spines and the tendency to produce branches in near whorls along the stems. However, *E. unicornis* branches more from lower down and tends to produce longer branches with fewer subdivisions, and consequently the plants are more rounded and symmetrical in appearance. In this new species the spine shields are not continuous down the stem, as they are in *E. unicornis*, but are much shorter than the internodes. In *E. unicornis* the stems are pale cream-green between the continuous and darker, usually brown spine shields. The leaf-rudiments are similar in size in both of them, but are stouter in *E. unicornis* and do not narrow toward the base. In *E. marrupana* the stipular prickles are adjacent to the leaf-rudiment, while in *E. unicornis* they are some distance away. The cyathia in *E. unicornis* are always deep maroon. The cyathial glands are closely contiguous and form a continuous narrow rim around the cyathium. In *E. marrupana* the glands are edged with red, are much broader, and are distinctly separate around the edge of the cyathium.

Paratypes. MOÇAMBIQUE. **Niassa:** E of Nungo, *Bruyns 9707* (E); just N of Maùa, *Bruyns 9714* (K).

Euphorbia stenocaulis Bruyns, sp. nov. TYPE: Moçambique. Zambézia: Mocuba, 250 m, 10 Nov. 2000, *P. V. Bruyns 8534* (holotype, BOL; isotypes, E, MO). Figure 1F–J.

Ab *Euphorbia plenispina* S. Carter cyathio flavo et glandibus cyathii annulum continuum circum cyathium facientibus nec distinctis distinguenda est.

Erect to somewhat creeping succulent to 30 cm tall with many stems, usually branching mainly at base; *stems* 4-angled, 4–7 mm thick, green suffused with red; angles without teeth, spine groups 10–15 mm apart; spines below leaves gray, paired, 2–3 mm, spreading downward; stipular spines 2–3 mm, ascending and forming an X-shape together with other 2 spines; spine shields very small, 3–4 mm, less than 1 mm broad, ± linear. *Leaf-rudiments* subulate, 2–3 × 1 mm. *Inflorescence* of solitary cymes each with 3 cyathia (central male, 2 laterals bisexual), on peduncle ca. 1.5 mm. *Cyathia* 3 × 4–5 mm, with green bracts, ca. 1.5 mm, with red midrib, yellow-green, broadly funnel-shaped, smooth and glabrous; glands yellow-green, ca. 2.5 mm × ca. 0.7 mm, fused into ± continuous cone; lobes semicircular, pale green, ca. 1 mm; male flowers with deeply dentate bracteoles, 1.5 mm, yellow, with pedicel ca. 2.5 mm; female flowers ca. 2.5 mm, green, with slender widely spreading styles, ca. 2 mm, with thickened apices, on stout pedicel ca. 1.5 mm. *Capsules* and seeds unknown.

This species is known on a small series of granite hills near Mocuba in the southern part of Zambézia Province. Here it occurs among dense clumps of *Coleochloa* in shallow mats of roots and soil on gently sloping, solid granite domes. Where it was found, it is extremely common and occurs together with *Huernia erectiloba* L. C. Leach & Lavranos, *Sarcostemma viminale*, and various species of *Xerophyta*.

In this slender-stemmed species, the stems creep and become somewhat rhizomatous. They are bright green with faint red markings and armed with very fine weak spines and with more or less equally long and similarly fine stipular prickles.

Euphorbia stenocaulis is similar to *E. plenispina*, which was described from a single, rather incomplete herbarium specimen. Both possess slender stems and have spines and prickles of equal length. The new species differs from *E. plenispina* in that the spines are somewhat shorter but, most particularly, in the yellow cyathia with the glands continuous around the top of the cyathium and not separate at all (red and separate in *E. plenispina*; Carter, 1999).

Acknowledgments. I thank M. da Silva (LMA) for his assistance during our travels in Moçambique, and the curators of the Portuguese herbaria COI and LISC for the loan of material.

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